Sept. 24, 1940. H. SCHEDEL 2,215,798

VACUUM VESSEL

Filed Nov. 5, 1937

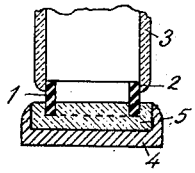



Fig. 1

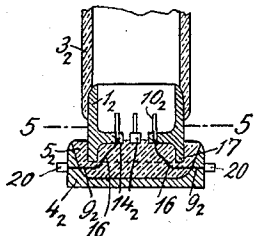



Fig. 4

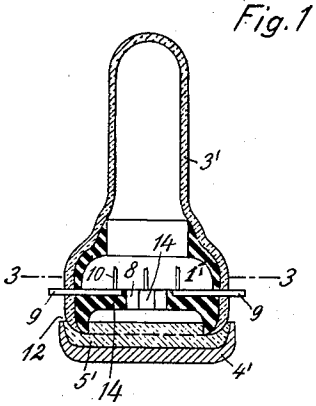



Fig. 2

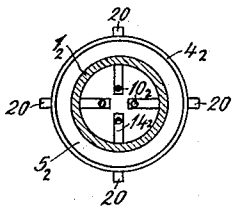



Fig. 5

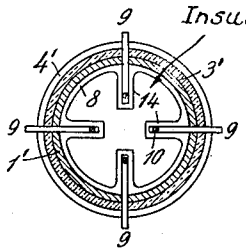



Fig. 3

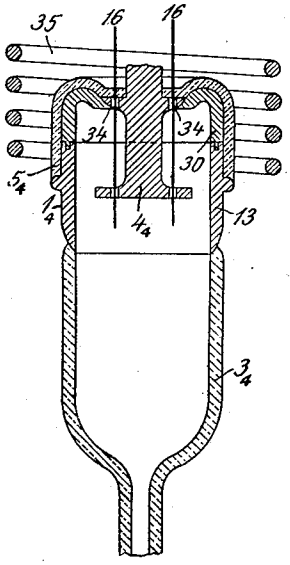



Fig. 7

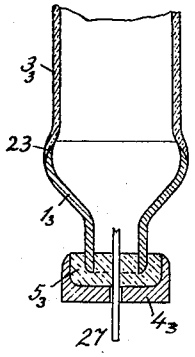



Fig. 6

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2,215,798

## VACUUM VESSEL

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8 Claims. (Cl. 250—27.5)

The invention relates to vacuum vessels or electric discharge vessels of the kind having a glass bulb and a cover therefor that consists of a material not easy to soften, such as a metal or a ceramic material.

In prior devices of this type the glass bulb and cover are melted or burned to each other. When manufacturing these devices the glass bulb if overheated may undergo deformation or to melt down onto the cover.

In devices as provided by the invention the metallic or ceramic cover is not melted with the glass bulb but is melted with a hollow or tubular body made of a ceramic material or of metal, this body being in its turn united with the glass bulb. Such hollow or tubular body is thus arranged as an intermediary member which is difficult to soften and by which the bulb and cover are interconnected.

The invention and its advantages will be understood from the following description, reference being had to the accompanying drawing in which

Fig. 1 is a sectional view showing one embodiment of the invention, this embodiment illustrating the fundamental idea thereof. Fig. 2 is a sectional view representing a modification of the arrangement shown in Fig. 1. Fig. 3 represents a section on line 3—3 of Fig. 2. Fig. 4 is a sectional view representing still another modification. Fig. 5 shows a section on line 5—5 of Fig. 4, Fig. 6 is a sectional view illustrating a further alternative form of the invention. Fig. 7 is a sectional view showing still another embodiment thereof.

Like reference characters denote like parts throughout the several views.

In the arrangement shown in Fig. 1 the said intermediary member 1 is in the shape of a ring to one edge of which the glass bulb 3 is fastened at 2 by melting. The other edge of the member 1 is united with the cover 4 by a seal or melt 5, this cover being a sort of receptacle containing the melt. Member 1 may be of a ceramic material or of a suitable metal or may consists of hard glass or a mixture of glass and ceramic material. The seal 5 may be a glass of a kind, for instance, containing molybdenum oxide or another compound of molybdenum.

In the arrangement represented in Figs. 2 and 3 member 1' is of a ceramic material and is completely coated with part of the bulb 3'. Member 1' here has an internal annular flange 8 provided with radial arms 14 to which outwardly extending conductors 9 are fitted, these conductors extending through member 1' and the glass coating thereof formed by bulb 3'. The conductors 9 are fixed to the arms 14 by means of a binding agent, for example, "pyrex" or quartz, which is more difficult to soften than glass. To these conductors wires 10 for supporting the electrode system, not shown, are fixed. The parts 1', 3' are both seated in the seal 5' contained in cover 4'. However, seal 5' may be dispensed with if bulb 3' is made not only to cover member 1' but also to seal the joint shown at 12 in Fig. 2.

The arrangement represented in Figs. 4 and 5 is similar to that shown in Figs. 2 and 3. The conductors $9_2$ in Figs. 4 and 5 are arranged to extend through the cover $4_2$ between member $1_2$ and the face end of cover $4_2$ and are connected to the supporting wires $10_2$ by wires 16 embedded in the melt $5_2$. The conductors $9_2$ are also joined to metallic junction members 20 fitted to the outside of the cover $4_2$. Bulb $3_2$ may be separate from the seal 5, as shown, or may be melted therewith similarly to the showing of Fig. 2.

In the arrangement represented in Fig. 6 member $1_3$ is of metal and is tapered toward cover $4_3$ which thus may be smaller than the other corresponding covers 4 shown in Figs. 1 to 5. At 23 bulb $3_3$ and member $1_3$ are interconectend by melting. A lead 27 extends through the face end of the cover and through melt $5_3$.

In the arrangement shown in Fig. 7 member 1 is composed of a ceramic part 13 and a metal part 30. Part 13 is melted with the bulb $3_4$. Part 30 is united with part 13 and cover $4_4$ by the melt $5_4$. Cover $4_4$ has apertures 34 through which leads 16 extend which are fastened by the melt $5_4$. A coil 35 is intended to carry high frequency currents in order to heat part 30 by eddy currents originating in this part and thereby to melt a glass material applied to the assembly $4_4$, 30, 13, thus producing the melt $5_4$. The ceramic member 13 acts to keep the heat away from bulb $3_4$.

Member 1 should be able readily to expand or contract in the direction of radii under the influence of temperature variations.

The coefficient of expansion of member $1_4$ is preferably of a value intermediate of those of the bulb and cover.

It will be seen that vacuum vessels as provided by the invention are much simpler to manufacture than has been the case heretofore. Furthermore, devices of the novel construction can be readily opened and closed again in order to repare or replace the electrode system or to remedy leaks of the vessel. To such end the members difficult to soften, especially cover 4, are heated

to such extent that the cover can be removed. This may be done without danger of deformation or injury to any part of the vessel. Also, whenever member 1 happens to become leaky, as during the manufacture of the vessel, then by heating the cover the glass constituting the bulb 3 may be caused to join the liquefied seal 5, thus closing the member 1 with a vacuumtight coating.

What is claimed is:

1. A vacuum tube vessel comprising a glass bulb, a closure member therefor made of material having a higher melting point than said bulb, a tubular member made of material having a higher melting point than said bulb sealed directly to said bulb, said tubular member having a plurality of radially extending arms, an electrode system for said tube, and supporting wires and leads for said electrodes carried by said radially extending arms, and a seal of material having a melting point lower than said closure member and said tubular member for sealing together said closure member and said tubular member.

2. A vacuum tube vessel comprising a glass bulb, a closure member therefor made of material having a higher melting point than said bulb, a tubular member made of material having a higher melting point than said bulb sealed directly to said bulb, said tubular member having a plurality of radially extending arms, an electrode system for said tube, and supporting wires and leads for said electrodes carried by said radially extending arms, said leads being fixed to said arms by a binding agent which softens at a higher temperature than glass, and a seal of material having a melting point lower than said closure member and said tubular member for sealing together said closure member and said tubular member.

3. A vacuum tube vessel comprising a glass bulb, a closure member therefor made of material having a higher melting point than said bulb, a tubular member made of material having a higher melting point than said bulb sealed directly to said bulb, a plurality of leads carried by said tubular member and fixed thereto by a seal difficult to soften, and a seal of material having a melting point lower than said closure member and said tubular member for sealing together said closure member and said tubular member.

4. A vacuum tube vessel comprising a glass bulb, a tubular member sealed directly to said bulb, said member having a plurality of radially extending arms, an electrode system for said tube and supporting wires and leads for said electrodes carried by said radially extending arms, and a closure member sealed to said tubular member.

5. A vacuum tube vessel comprising a glass bulb, a closure member therefor made of material having a higher melting point than said bulb, a tubular member made of material having a higher melting point than said bulb sealed directly to said bulb and surrounded thereby, and a seal of material having a melting point lower than said closure member and said tubular member for sealing together said closure member and said tubular member, said seal contacting directly with said bulb so that said tubular member is completely enclosed by said bulb and said seal.

6. A vacuum tube vessel according to claim 1 wherein said leads are fixed to said radially extending arms by a binding agent more difficult to soften than glass.

7. A vacuum tube vessel according to claim 4 wherein the seal between the closure member and tubular member comprises glass containing a molybdenum compound.

8. A vacuum tube vessel according to claim 4 wherein said leads pass between said tubular member and closure member to the outside of said vessel.

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